

**Claims**

1. Method for producing metal, alloy and composite powders with a mean particle diameter D<sub>50</sub> of at most 25 µm, determined using the particle measuring apparatus Microtrac® X 100 to ASTM C 1070-01, from a starting powder with a greater mean particle diameter, characterised in that
    - 5 a) the particles of the starting powder are processed in a deformation step into flake-like particles, of which the particle diameter to particle thickness ratio is between 10:1 and 10,000:1, and
    - 10 b) the flake-like particles are subjected to comminution grinding in the presence of a grinding aid.
  - 15 2. Method according to claim 1, characterised in that a deagglomeration stage follows comminution grinding.
  3. Method according to either claim 1 or claim 2, characterised in that the metal, alloy or composite powder has a composition of formula I
    - 20 hA-iB-jC-kD (I)
- wherein
- 25 A represents one or more of the elements Fe, Co, Ni,
  - B represents one or more of the elements V, Nb, Ta, Cr, Mo, W, Mn, Re, Ti, Si, Ge, Be, Au, Ag, Ru, Rh, Pd, Os, Ir, Pt,
  - C represents one or more of the elements Mg, Al, Sn, Cu, Zn, and
  - D represents one or more of the elements Zr, Hf, rare-earth metal,
- 30 and h, i, j and k indicate the percentages by weight, wherein

h, i, j and k in each case independently of one another represent 0 to 100 % by weight,

with the proviso that the sum of h, i, j and k is 100 % by weight.

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4. Method according to claim 3, characterised in that

- A represents one or more of the elements Fe, Co, Ni,
- B represents one or more of the elements V, Cr, Mo, W, Ti,
- 10 C represents one or more of the elements Mg, Al and
- D represents one or more of the elements Zr, Hf, Y, La.

5. Method according to either claim 3 or claim 4, characterised in that

- 15 h represents 50 to 80 % by weight
- i represents 15 to 40 % by weight
- j represents 0 to 15 % by weight, and
- k represents 0 to 5 % by weight

20 with the proviso that the total of h, i, j and k is 100 % by weight.

6. Method according to any one of claims 1 to 5, characterised in that the produced metal, alloy or composite powders have a mean particle diameter D50 of at most 15  $\mu\text{m}$ , determined using a Microtrac® X 100 to ASTM C 1070-01.

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7. Method according to any one of claims 1 to 6, characterised in that the starting powder is a powder with spherical or irregularly shaped particles and has a mean particle diameter D50, determined to ASTM 1070-01, measured using a Microtrac® X 100, of greater than 25  $\mu\text{m}$ .

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8. Method according to any one of claims 1 to 7, characterised in that the deformation step is carried out in a rolling mill, an eddy mill, a high-energy mill or an attritor.
- 5 9. Method according to any one of claims 1 to 8, characterised in that during comminution grinding liquid grinding aids, waxes and/or brittle powder are added as the grinding aid.
- 10 10. Method according to claim 9, characterised in that the grinding aid is paraffin oil, paraffin wax, metal powder, alloy powder, metal sulphide, salt and/or hard material powder.
11. Method according to any one of claims 1 to 10, characterised in that the grinding aid is produced *in situ* during comminution grinding.
- 15 12. Method according to claim 11, characterised in that the grinding aid is produced by adding a reactive gas which reacts under the conditions of comminution grinding with the starting powder while forming a brittle phase.
- 20 13. Method according to any one of claims 2 to 12, characterised in that the deagglomeration is carried out in a gas contrajet mill, an ultrasound bath, a kneader or a rotor-stator.
- 25 14. Method according to any one of claims 2 to 13, characterised in that the deagglomeration is carried out in the presence of one or more liquids, dispersing aids and/or binders.
15. Metal, alloy and composite powder with a mean particle diameter D<sub>50</sub> of at most 25 µm, determined using the particle measuring apparatus Microtrac® X 100 to ASTM C 1070-01, obtainable by a method according to any one of claims 1 to 14.

16. Metal, alloy and composite powder with a mean particle diameter D<sub>50</sub> of at most 25 µm, determined using the particle measuring apparatus Microtrac® X 100 to ASTM C 1070-01, characterised in that, until the maximum contraction is attained, the contraction, determined using a dilatometer to DIN 51045-1, is at least 5 1.05 times the contraction of a metal, alloy or composite powder with identical chemical composition and identical mean particle diameter D<sub>50</sub>, the powder to be investigated being compressed to a compressed density of 50 % of the theoretical density before measuring the contraction.
- 10 17. Mixture containing 1 to 95 % by weight of a metal, alloy or composition powder according to claim 15 or 16 and 99 to 5 % by weight of a metal, alloy or composite powder produced by atomisation.